

# New taxonomic assignments for two Palaearctic Calisiinae genera (Heteroptera: Aradidae) with description of a new species from China

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## Abstract

Examination of paratypes of the Palaearctic species *Calisius turanicus* KIRITSHENKO, 1959 and *Calisius amudaryanus* HEISS & KERZHNER, 1999 proved that they are not congeneric with *Calisius* STÅL, 1860 or *Aradosyrtris* A. COSTA, 1864. New genera are established for them: *Neocalisius* gen.n. for *C. turanicus* and *Pachycalisius* gen.n. for *C. amudaryanus*. *Aradosyrtris yunnanus* sp.n. from China is described and imaged. A key to Palaearctic genera of Calisiinae is presented.

**Key words.** Hemiptera, Aradidae, Calisiinae, Palaearctics, new genera, *Neocalisius*, *Pachycalisius*, China, new species.

## Zusammenfassung

Die Überprüfung und der Vergleich von Paratypen der bisher der Gattung *Calisius* STÅL, 1860 zugeordneten paläarktischen Arten *Calisius turanicus* KIRITSHENKO, 1959 und *Calisius amudaryanus* HEISS & KERZHNER, 1999 haben ergeben, dass beide Taxa weder zu *Calisius* STÅL, 1860 noch zu *Aradosyrtris* A. COSTA, 1864 gehören. Für diese werden zwei neue Gattungen vorgeschlagen: *Neocalisius* gen.n. für *C. turanicus* und *Pachycalisius* gen.n. für *C. amudaryanus*. *Aradosyrtris yunnanus* sp.n. aus China wird beschrieben und abgebildet. Ein Bestimmungsschlüssel für die paläarktischen Gattungen der Calisiinae wird vorgelegt.

## Introduction

The subfamily Calisiinae STÅL, 1873 is one of eight subfamilies of the flat bug family Aradidae BRULLÉ, 1836 and shows a worldwide distribution. In the synonymic list of World Aradidae (KORMILEV & FROESCHNER 1987), more than 100 species of Calisiinae assigned to six genera were listed: *Aradacanthia* A. COSTA, 1864 (3 species, Oriental); *Calisiopsis* CHAMPION, 1898 (4 species, Neotropis); *Calisius* STÅL, 1860 (89 extant species, Old and New World; 1 fossil species from Baltic Amber); *Heissia* KORMILEV, 1986 (2 species, Africa); *Paracalisiopsis* KORMILEV, 1963 (1 species, Africa), and *Paracalisius* KORMILEV, 1974 (1 species, Africa). Unless KORMILEV (1963, 1974, 1986) recognized that some African “*Calisius*” belong to new genera and described them, *Calisius* was and is still a conglomerate for all small specimens of Calisiinae with a long scutellum covering the tergal plate of the abdomen.

*Calisius* was assumed to be of worldwide distribution, predominantly occurring in tropical and subtropical regions. However, after examination of Stål's genus type species, *Calisius*

*pallipes* STÅL, 1860 from Brazil, HEISS (2015) recognized this as a Neotropical taxon and reinstated *Aradosyrtris* A. COSTA, 1864 (formerly considered as a junior synonym of *Calisius*) for two Palaearctic species, *A. ghiliani* A. COSTA, 1864 and *A. salicis* (HORVÁTH, 1913). *Calisius* has remained unrevised and it is likely that some other species currently placed in *Calisius* should be removed from this genus.

The Palaearctic fauna of Calisiinae (cf. AUKEMA et al. 2013) is rather species-poor compared to that of the Oriental-Indopacific region and comprises the following species described to date (HEISS 2001, 2015, BAI et al. 2009, HEISS et al. 2023):

*Aradacanthia heissi* BAI, ZHANG & CAI, 2009 (China, extralimital from India, Thailand)

*Aradosyrtris ghiliani* A. COSTA, 1864 (Algeria, Tunisia, Spain, France, Italy)

*Aradosyrtris salicis* (HORVÁTH, 1913) (Austria, Serbia, Bulgaria, Greece, Israel)

*Aradosyrtris shonoi* HEISS, SHIMAMOTO & NAGASHIMA, 2023 (Japan: Ryukyu Islands)

*Calisius amudaryanus* HEISS & KERZHNER, 1999 (Uzbekistan)

*Calisius turanicus* KIRITSHENKO, 1959 (Turkmenistan, Uzbekistan, Afghanistan, Tadzhikistan)

*Nipponocalisius dimorphus* HEISS, SHIMAMOTO & NAGASHIMA, 2023 (Japan)

*Nipponocalisius ishikawanus* HEISS, SHIMAMOTO & NAGASHIMA, 2023 (Japan)

*Nipponocalisius tomokunii* HEISS, SHIMAMOTO & NAGASHIMA, 2023 (Japan)

Examination of type material of *Calisius turanicus* and *Calisius amudaryanus* proved that their taxonomic position is to be revised. Distinct morphological differences justify the placement of these taxa in new genera, *Neocalisius* gen.n. and *Pachycalisius* gen.n., respectively. Furthermore, two specimens from Yunnan, China, available for study represent a distinct new species, *Aradosyrtris yunnanus* sp.n., which is described and depicted herein.

## Material and methods

The studied specimens originate from the collection of the author (CEHI). Together with his large aradid collection, they will later be deposited at the Zoologische Staatssammlung München (ZSM) of the Staatliche Naturwissenschaftliche Sammlungen Bayerns. One paratype of *Calisius amudaryanus* and one paralectotype of *Calisius turanicus* were a gift from the late Izya M. Kerzhner, Zoological Institute, Russian Academy of Science, St. Petersburg, to the author.

Measurements were taken using a micrometre eyepiece and are given in millimetres.

Abbreviation used: deltg = dorsal external laterotergite (connexivum).

The term “clypeus” is used for the structure of tylus + genae which are fused into a bulb-like structure in some Calisiinae.

Photos were taken through a Nikon Coolpix P300 and edited with photoshop.

Acronyms of repositories:

CAU China Agricultural University, Beijing, China

CEHI Collection Ernst Heiss, Tiroler Landesmuseum, Innsbruck, Austria

NMPC National Museum, Prague, Czech Republic

- TUA Laboratory of Entomology, Faculty of Agriculture, Tokyo University of Agriculture, Kanagawa, Japan
- ZIUP Istituto di Zoologia, Università di Napoli, Portici, Italy
- ZMAS Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia

## Taxonomy

### Subfamily Calisiinae STAL, 1873

#### Key to genera of Palaearctic Calisiinae

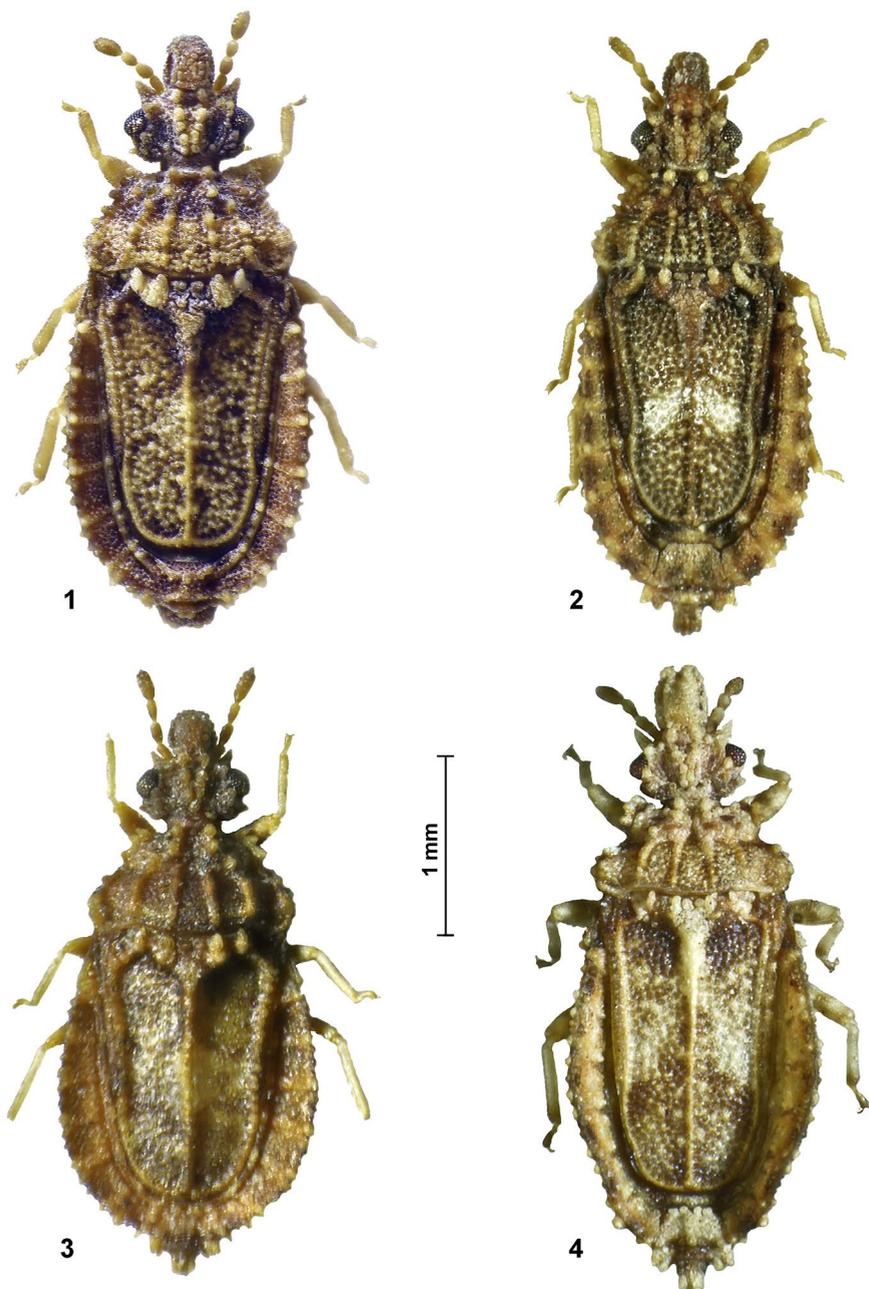
- 1 Body length 4.8–6.0 mm. Genae produced over tylus. Apex of clypeus enlarged and beset with finger-like tubercles. Antennal segment IV densely beset with distinct plaques. Pronotum bilobate, lateral margin of each lobe with 6–8, lateral margins of deltg II–VII with four long finger-like tubercles (Fig. 7). ..... *Aradacanthia*
- Smaller size, body length less than 4 mm. Apex of clypeus and lateral margins of deltg II–VII beset with small tubercles or teeth. Antennal segment IV only with few inconspicuous plaques. Lateral margins of deltg II–VII with 3–6 conical tubercles or nodules. .... 2
- 2 Clypeus elevated medially; anterolaterally fused with rim-like dilated lamellate genae; apices beset with tubercles (Fig. 4). ..... *Nipponocalisius*
- Clypeus bulb-like, anteriorly rounded and not dilated, its surface tuberculate. .... 3
- 3 Tergite VIII dorsally exposed and forming a transverse bridge in male and female. Base of scutellum with four large tubercles anteriorly overlapping pronotum. Lateral margins of deltg II–VII with three rounded conical tubercles (Figs 1–3). ..... *Aradosyrtsis*
- Tergite VIII with or without dorsally exposed transverse bridge in male, lacking in female. Base of scutellum without large tubercles overlapping pronotum. Lateral margins of deltg II–VII with 5–6 rounded conical tubercles. .... 4
- 4 Clypeus oval. Interocular space smaller, about 3.6–3.8 times width of eye. Antennae longer; antennal segment IV produced over clypeus (Fig. 5). Lateral margins of deltg II–VII with five, partly four rows of conical tubercles. Male with dorsally exposed tergite VIII, lacking in female. .... *Neocalisius* gen.n.
- Clypeus wide, semi-circular, laterally depressed. Interocular space wider, about 6.0–6.7 times width of eye. Antennae shorter, not exceeding apex of clypeus (Fig. 6). Lateral margins of deltg II–VII with six, partly with five nodules. Male and female without dorsally exposed tergite VIII. .... *Pachycalisius* gen.n.

#### Treatment of taxa

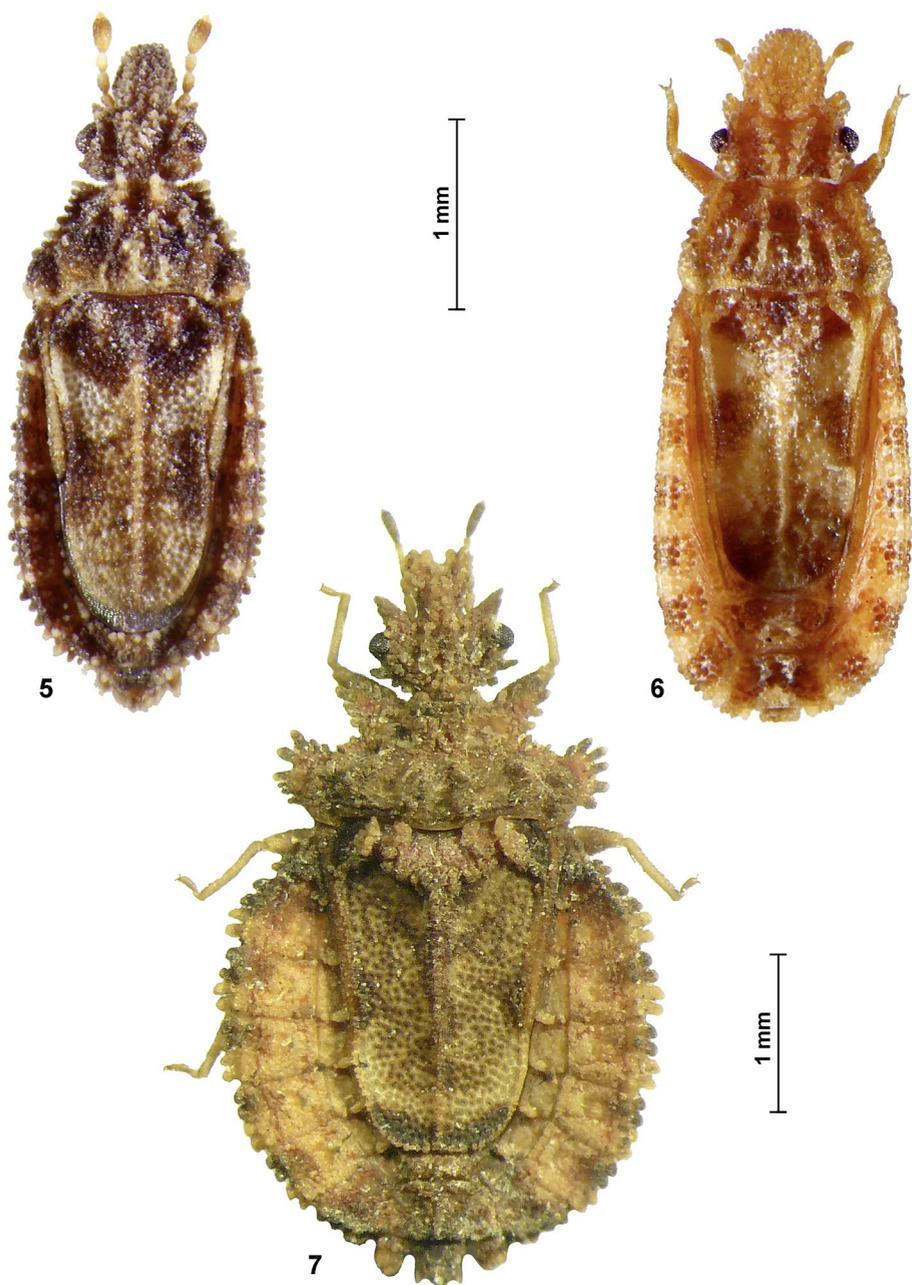
##### *Aradacanthia* A. COSTA, 1864 (Figs 7, 13)

Type species. *Aradacanthia multicalcarata* A. COSTA, 1864, by monotypy.

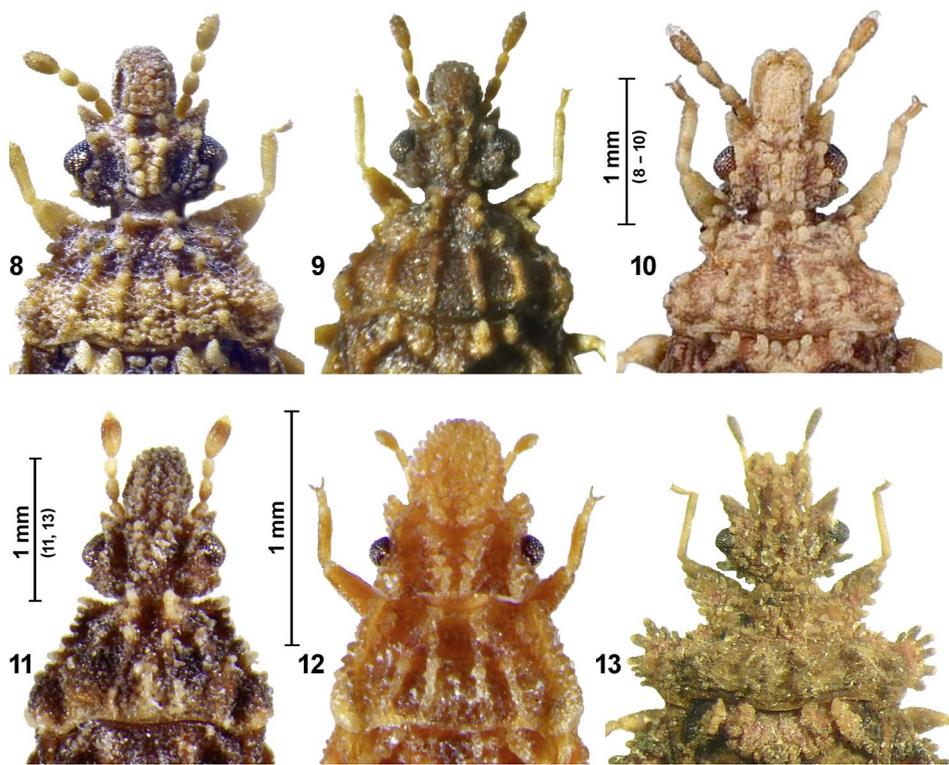
Notes. The holotype of the type species is of unknown origin and could not be traced in Costa's collection at ZIUP (Carapezza pers. info). This genus comprises four species to date: *A. multicalcarata* A. COSTA, 1864 (Malaysia, Philippines, Borneo), *A. kormilevi* HEISS, 1984 (Papua New Guinea), *A. singhalica* HEISS, 1984 (Sri Lanka), and the only Palaearctic species *A. heissi* BAI, ZHANG & CAI, 2009 (China, extralimital from North-eastern India and Thailand). A key to the species was presented by BAI et al. (2009).



Figs 1–4. Habitus of (1) *Aradosyrtes ghiliani* (male, Tunisia); (2) *Aradosyrtes salicis* (female, Bulgaria); (3) *Aradosyrtes yunnanus* sp.n. (paratype, female, China); (4) *Nipponocalisius tomokunii* (female, Japan).



Figs 5–7. Habitus of (5) *Neocalisius turanicus* (male, Tadzhikistan); (6) *Pachycalisius amudaryanus* (female, Uzbekistan); (7) *Aradacanthia heissi* (female, Thailand).



Figs 8–13. Head and pronotum of (8) *Aradosyrtris ghiliani*; (9) *Aradosyrtris yunnanus* sp.n.; (10) *Nipponocalisius tomokunii*; (11) *Neocalisius turanicus*; (12) *Pachycalisius amudaryanus*; (13) *Aradacanthia heissi*.

**Diagnosis.** *Aradacanthia* is easily recognized by its wide, round habitus and the size of ca. 5–6 mm, distinctly longer than all other genera of Calisiinae. Antennal segment IV is densely beset with distinct plaques. Further characteristics are the finger-like tubercles at apex of clypeus, along lateral margin of bilobate pronotum, and on deltg II–VII. Tergite VIII is dorsally exposed in male, lacking in female.

***Aradacanthia heissi* BAI, ZHANG & CAI, 2009 (Figs 7, 13)**

**Type material examined.** Paratypes. 2 ♀♀: Thailand, Nan Province, Ban Huray Kon env., 27.V–10.VI 2002 Prudek & Obořil leg. (CEHI); 2 ♂♂, 3 ♀♀: NE-India, Meghalaya / E of Tura 500–600 m, 25°30 N, 90°14 E, 2–5.V 2002 M.Tržna & P. Penda leg. (CEHI).

**Notes.** First discovered in Hainan Island, South-eastern China (holotype in CAU), this species was also recorded from Thailand and North-eastern India. It is distinguished by a set of characters described in detail and as indicated in the key by BAI et al. (2009). SHI et al. (2012) presented a study of the complete mitochondrial genome of this taxon, the first one published of the subfamily Calisiinae.

**Measurements.** Body length ♂♂, 4.8–5.1 mm, ♀♀ (incl. holotype) 5.2–5.4 mm.

**Distribution.** North-eastern India, Thailand, China.

***Aradosyrtis* A. COSTA, 1864** (Figs 1–3, 8, 9)

Type species. *Aradosyrtis ghiliani* A. COSTA, 1864, by monotypy.

Notes. BERGROTH (1894: 98) synonymized *Aradosyrtis* with *Calisius*. HEISS (2015: 5) reinstated *Aradosyrtis*. No type specimens could be located in Costa's collection at ZIUP (Faraci, pers. comm.). After recognizing that the type species of the genus *Calisius* STÅL, 1860, *C. pallipes* is a neotropical taxon distinctly differing from Old World "*Calisius*" (HEISS 2015), *Aradosyrtis* was raised from synonymy for *A. ghiliani* and *A. salicis*, both of West Palaearctic origin. Unrecorded specimens of a new species from China share all essential characters of *Aradosyrtis* and are therefore assigned to this genus.

Diagnosis. Body length 1.90–3.35 mm. Macropterous or brachypterous. Habitus of ovate outline. Clypeus of bulb-like shape and with granulate surface. Antennal segments I–III of equal length, IV longest and thickest, about twice the length of II; variable number of plaques present on segment IV. Pronotum transverse, with four longitudinal carinae, the lateral ones shorter, joining the medial ones on anterior lobe. Scutellum triangularly elevated at base, with at least four large tubercles, the lateral ones overlapping pronotum; lateral margins and median carinate ridge granulate or beset with tubercles; surface punctured with a partly variable but specific colour pattern. Lateral margins of deltg II–VII with a dorsal and a subventral row of three round or conical tubercles on each segment. Transverse sclerite of tergite VIII exposed and visible from above in males and females. – This set of characters distinguishes *Aradosyrtis* from other Calisiinae as indicated in the key.

***Aradosyrtis yunnanus* sp.n.** (Figs 3, 9)

Type material. Holotype (♂). China, Yunnan province, 27°08' N, 100°14' E, 2900–3500 m, Yulongshan mts., Baishui 7–12.VII 1990, Vit Kuban leg. (CEHI); paratype (1 ♀) collected with holotype (CEHI); all provided with type labels.

Diagnosis. Habitually related to *A. shonoi* from Japan but differing by smaller and less produced tubercles (vs. larger and more produced) along lateral margins and on carinae of pronotum, the median ridge of scutellum and lateral margins of deltg II–VII.

Description. Macropterous. Colouration yellowish brown, with lighter parts and patches; pattern of scutellar disk as in Figure 3.

Measurements. Holotype (♂): body length 3.1 mm, width of abdomen 1.8 mm; paratype (♀): body length 3.1 mm.

Head slightly longer than wide (1.40 : 1.30 mm). Clypeus without dilated genae; apex rounded. Antennae shorter than width of head, length of antennal segments I : II : III : IV = 0.25 : 0.25 : ? : ? (3 and 4 missing in holotype). Double row of tubercles on vertex distinct.

Pronotum nearly twice as wide as long (2.40 : 1.25 mm); lateral margins converging anteriorly, beset with distinct tubercles; disk of pronotum with four tuberculate carinae. Scutellum elevated at triangular base, with four large and prominent tubercles overlapping pronotum, and two smaller ones at middle.

Abdomen. Lateral margins of deltg II–VII with the usual double row of three tubercles, with lighter and darker colouration.

Female. Basic structures, size and colouration as male, exposed transverse sclerite of tergite VIII present.

Distribution. Only recorded from the type locality in Yunnan, China.

**Remarks.** After *Aradacanthia heissi*, this is only the second Calisiinae reported from China so far. Although Yunnan Province is subtropical, its fauna is included in the Catalogue of Palaearctic Heteroptera (AUKEMA et al. 2013). From its rich forest habitats, several new genera and species of Aradidae were collected and described; further Calisiinae taxa should therefore be expected.

**Etymology.** Named after the Chinese province of Yunnan, where this interesting species was collected.

***Nipponocalisius* HEISS, SHIMAMOTO & NAGASHIMA, 2023** (Figs 4, 10)

**Type species.** *Nipponocalisius ishikawanus* HEISS, SHIMAMOTO & NAGASHIMA, 2023.

**Notes.** To date, this genus comprises three species recently described by HEISS et al. (2023) from Japan; a key to the species was presented.

**Diagnosis.** Macropterous (body length 2.50–3.10 mm) or brachypterous (body length 1.85–2.40 mm). Habitus of ovate outline. Tylus elevated medially; anterolaterally fused with rim-like dilated, lamellate genae; their apices beset with tubercles. Antennae usually about as long as width of head (longer in *N. ishikawanus*); segment III slightly longer than II, IV longest and thickest; variable number of plaques present on segment IV but difficult to detect. Pronotum transverse, with four longitudinal carinae, the lateral ones shorter, joining the medial ones on anterior lobe. Scutellum triangularly elevated at base, with at least four large tubercles, the lateral ones overlapping pronotum; lateral margins and median carinate ridge granulate or beset with tubercles; surface deeply punctured with a partly variable but specific colour pattern. Lateral margins of deltg II–VII with a dorsal and a subventral row of three round or conical tubercles on each segment. Transverse sclerite of tergite VIII exposed and visible from above in males and females. – *Nipponocalisius* is recognized by the rim-like expanded genae and thereby differs from all other genera of Calisiinae. The most closely related genus, *Aradosyrtsis*, is distinguished by the set of characters listed above.

**Distribution.** Mainland Japan; Ogasawara Islands and Ryukyu Archipelago.

***Neocalisius* gen.n.** (Figs 5, 11)

**Type species.** *Calisius turanicus* KIRITSHENKO, 1959, by monotypy.

**Notes.** Re-examination of a paralectotype and additional specimens and comparison with other Palaearctic “*Calisius*” brought to light that this species differs from all others by a combination of characters and cannot be placed into one of the genera recognized to date. Therefore, the new genus *Neocalisius* gen.n. is proposed.

**Diagnosis.** Length 3.1–3.5 mm. Habitus of ovate outline. Clypeus egg-shaped; surface finely granulate; apex rounded, reaching basis of antennal segment IV. Antennae short, about 0.8 times as long as width of head, segments I–III short and of subequal length, IV longer and thicker, only few plaques discernible. Lateral margins of pronotum straight, converging anteriorly, densely beset with blunt tubercles. Base of scutellum without larger tubercles overlapping pronotum. Lateral margins of deltg II–VII with a dorsal and a ventral row of five, partly of four conical tubercles, the posterior one whitish, the anterior ones dark. Dorsally exposed tergite VIII present in male, lacking in female. – This genus is distinguished from other Palaearctic genera by the characters indicated in the key.

**Etymology.** From Greek prefix neo-, meaning new, and the genus name *Calisius*; gender masculine.

***Neocalisius turanicus* (KIRITSHENKO, 1959), comb.n.**

**Material examined.** Paralectotype (♂). Chiva (Uzbekistan), 5 VI 929 [= 1929], Gerasimov & Moratshinsky (CEHI); 2 ♂♂, 3 ♀♀, Uzbekistan, Kulatau Amu Dar'ya, 20 km SO Meshkeli, 9–10 VI 966 [= 1966] Kerzhner (CEHI); 1 ♀, Afghanistan, Nuristan, Bashgultal, 1100 m, 22.iv.1953; 1 ♀, Afghanistan, Nuristan, Kutiau, 1450 m, 2.V.1953, J. Klapperich lgt. (NMPC).

**Measurements.** Body length of paralectotype (♂) 3.15 mm; of additional specimens (2 ♂♂) 3.15–3.20 mm, (3 ♀♀) 3.5–3.55 mm.

**Notes.** As KIRITSHENKO (1959) has not designated a holotype, HEISS & KERZHNER (1999) designated a male from Chiva, Uzbekistan, as lectotype (ZMAS).

**Ecology.** According to HEISS & KERZHNER (1999) specimens were collected together with "*Calisius*" *amudaryanus* under scales of bark on young *Populus diversifolia* SCHRENK and *Salix* sp.; in Kiritschenko's collection are specimens reported from *Salix* sp., *Populus pruinosa* SCHRENK, and *Platanus* sp.

**Distribution.** Uzbekistan, Turkmenistan, Tadjikistan, Afghanistan.

***Pachycalisius* gen.n. (Figs 6, 12)**

**Type species.** *Calisius amudaryanus* HEISS & KERZHNER, 1999, by monotypy.

**Notes.** The re-examination of a paratype and the description and comparison with *Aradosyrtris* and *Neocalisius* gen.n. has shown that *amudaryanus* differs from them by a set of characters supporting the necessary assignment to a new genus, *Pachycalisius* gen.n.

**Diagnosis.** Body length 3.20–3.75 mm. Habitus subparallel. Clypeus large, widely rounded, and anterolaterally depressed. Antennae short and thin, not produced over clypeus, antennal segment IV with hardly discernible, small, single plaques. Pronotum strongly transverse, about three times as wide as long, with dentate lateral margins: Base of scutellum without large tubercles overlapping pronotum. Deltg II–VII with two rows of six confluent round tubercles, mesal surface of deltg II–VII with four rows of round tubercles; Tergite VIII not dorsally exposed in male and female. – *Pachycalisius* is distinguished from other genera of Calisiinae as indicated in the key.

**Etymology.** From Greek prefix pachy-, meaning thick, stout (referring to the large and wide clypeus), and the genus name *Calisius*; gender masculine.

***Pachycalisius amudaryanus* (HEISS & KERZHNER, 1999), comb.n.**

**Type material examined.** Paratype (♂). Uzbekistan, Kulatau Amu Dar'ya, 20 km SO Meshkeli, 9–10 VI 966 [= 1966] Kerzhner (CEHI).

**Note.** The holotype is a male from Uzbekistan (in ZMAS).

**Ecology.** Types were collected together with *Neocalisius turanicus* in crevices under scales of bark of older *Salix* sp. (Kerzhner, pers. observation).

**Distribution.** Only recorded from Uzbekistan (HEISS 2001). The record from Afghanistan in AUKEMA et al. (2013: 350) refers to *N. turanicus*.

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